## REMARKS

This responds to the Office Action mailed on November 27, 2007. Reconsideration is respectfully requested.

Claims 1, 10, 15, 20, 22, and 28 are amended, no claims are canceled, and no claims are added; as a result, claims 1 – 30 remain pending in this application.

### *Objections to the Specification*

The specification was objected to due to informalities. The Examiner had objected to the disclosure for failing to disclose the need to apply phase compensation after the channel equalizer, as recited in claims 1, 15, 22, and 28. Applicant's point out that one reason for applying a phase compensation estimate to channel equalized subcarriers is to compensate for, among other things, the effects of phase noise from the transceiver's oscillators. This is discussed in Applicant's specification on page 4 lines 1 – 14, for example, as well as in other places. Channel estimates do not compensate for these additional factors that may affect the phase of the frequency domain signals within a receiver. In view of this, Applicant submits that no correction to the specification is required and that the objection to the disclosure has been overcome.

### §*103 Rejection of the Claims*

Claims 1-5, 18, 19, 22 and 28-30 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim (U.S. 2003/0063558 A1) in view of Peeters et al. (U.S. 6,628,738 B1).

Applicant's claim 1 is directed to generating a phase compensation estimate and includes recursively filtering an observation vector formed by weighted pilot subcarriers of a data symbol of an orthogonal frequency division multiplexed (OFDM) packet. As recited in claim 1, the recursively filtering includes generating a predicted observation vector from a phase compensation estimate generated for a prior data symbol, and subtracting the predicted observation vector from the observation vector. As further recited in claim 1, the phase compensation estimate is applied to channel equalized subcarriers of the data symbol in the frequency domain after performance of a Fourier

transform on the data symbol. As further recited in claim 1, the pilot subcarriers are weighted based on fading gains. Applicant's other independent claims 15, 22, and 28 have similar recitations.

Kim has been cited by the Examiner for the application of a phase-compensation estimate to channel-equalized subcarriers after the performance of a Fourier transform. According to the Examiner, Kim fails to teach recursive filtering of an observation vector to generate the phase compensation estimate.

Peeters has been cited by the Examiner for disclosing the generation of a phase compensation estimate by recursive filtering an observation vector, and that the observation vector is formed by weighted pilot subcarriers. Applicant respectfully disagrees with this interpretation of Peeters and submits that Peeters discloses a feedback look (FBL) that operates as a phase-locked loop (see Peeters column 7, in particular lines 55 – 56), and that Peeters does not disclose a recursive filter or the performance of recursive filtering. Recursive filtering uses an output of the filtering as one of the inputs.

In Peeters, the ROTOR applies a phase shift to rotate each of the carriers to compensate for the frequency offset (see Peeters column 6 lines 46 – 58). In other words, the phase shift is fed back to the input and applied to the subcarriers as part of the feedback loop. Although Peeters filters the phase shift, there is no recursive filtering in which the phase shift output is applied back to the input of the filter. This is explained in more detail below.

Applicant's claim 1, however, distinguishes over Peeters by reciting that a predicted observation vector is generated from a phase compensation estimate for a prior data symbol using a recursive algorithm, and that the predicted observation vector is subtracted from the observation vector. This recursive process that modifies the observation vector is not taught by Peeters.

Peeters generates weights for each of the subcarriers based on SNR, and applies the weights to each of the subcarriers (see Peeters FIGs. 1 – 3 and column 7 lines 22 – 36). Peter further discloses that the weighted phase errors are summed together by adder S and normalized with normalization factor B by the divider DIV (see Peeters column 7, lines 47 – 49) to obtain a clock timing error ($\tau_e$) which is fed back to the rotation device

ROTOR. There is no recursive filtering of the clock timing error ($\tau_e$) or recursive filtering of the of the output of the FBL (see FIGs. 1 – 3). The output of the FBL is fed back to the input (prior to the FFT) (see FIG. 2 and FIG. 3), and is applied to the ROTOR as shown in FIG. 1).

Applicant's claim 1 recites that the observation vector, generated by weighted pilot subcarriers, is recursively filtered in which a predicted observation vector is subtracted from the current observation vector, and that the predicted observation vector is generated from a phase compensation estimate generated for a prior data symbol using a recursive algorithm. In Peeters, there is no recursive filtering of the weights $A_0 - A_{n-1}$ or use of normalization factor B that is re-applied to the weights or the normalization factor (see column 7 lines 47 – 56) in a recursive manner. The weights $A_0 - A_{n-1}$ are simply applied to the subcarriers, and the weighted phase errors are summed together and normalized by B. Applicant believes this operation is apparent from Peeters FIGs. 1, 2 or 3 and the description in column 7.

Accordingly, combing Peeters with Kim does not result in Applicant's claims 1, 15, 22, or 28.

Claim 15, further distinguishes over Peeters by reciting that the recursive filter uses a channel estimate, an additive noise power estimate, a signal to noise ratio (SNR), and a phase noise value estimate to perform the recursive filtering. The additive noise power estimate may, for example, help compensate for the effects of phase noise from the transceivers oscillators. Claim 20 further distinguishes over Peeters by reciting that the recursive filter subtracts the predicted observation vector from the observation vector to generate a residual vector, multiplies the residual vector by a gain matrix to generate a residual gain vector, adds the residual gain vector to a linear prediction vector to generate an estimate vector and extracts the phase compensation estimate for the data symbol from the estimate vector. This recursive process is not taught, suggested, or motivated by the combination of Kim and Peeters.

Claims 6 and 26 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim and Peeters et al., and further in view of Perets et al. ("A New

Phase and Frequency Offset Estimation Algorithm for OFDM Systems Applying Kalman Filter," Dept. of Electrical Engineering-Systems, Tel Aviv University, December 2002.)

Regarding claims 6 and 26, Perets has been cited for disclosing a Kalman filter, however Perets fails to disclose recursive filtering using a priori information about a dynamic model of phase and a phase noise power value from a phase noise spectrum of transceiver oscillators. Perets uses the channel response, ICI and AWGN (see Perets section 2 lines 10 – 14). Accordingly, the combination of Kim, Peeters, and Perets does not result in Applicant's claim 6 and 26. One advantage to Applicant's claim 6 and 26, for example is that the phase noise of the receiver can be compensated for.

The combination of Kim, Peeters, and Perets furthermore, does not result in Applicant's claim 1 because Perets does not disclose recursively filtering that includes generating a predicted observation vector from a phase compensation estimate generated for a prior data symbol using a recursive algorithm, and subtracting the predicted observation vector from the observation vector. In Perets, the Kalman filter estimates and tracks the ***phase and frequency*** offsets for ***each*** subcarrier (see Perets page 301 as stated the last sentence in section 3 regarding the number N of subcarriers, and the last sentence of section 4 regarding the application of the Kalman filter). This process requires substantial computing power. Applicant's claim 1, on the other hand, performs recursive filtering on a single vector (i.e., predicted observation vector) which is formed by weighted pilot subcarriers. This combination is not taught, suggested, or motivated by Perets, or the combination of Kim, Peeters, and Perets.

Claims 10, 11 and 20 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim and Peeters et al., and further in view of Perets et al. As discussed above, Perets does not disclose recursively filtering that includes generating a predicted observation vector from a phase compensation estimate generated for a prior data symbol using a recursive algorithm, and subtracting the predicted observation vector from the observation vector.

Claim 12 was also rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim, Peeters et al., and Perets et al., and further in view of Crawford (U.S. 2002/0159533 A1).

Claim 7 was also rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim and Peeters et al., and further in view of McFarland et al. (U.S. 7,027,530 B2).

Claims 8 and 27 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim, Peeters et al., and McFarland et al., and further in view of Crawford.

Claims 9, 17 and 25 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim and Peeters et al., and further in view of Crawford.

Claims 13 and 14 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim and Peeters et al., and further in view of Kuwabara et al. (U.S. 2001/0015954 A1) and Crawford.

Claims 15 and 16 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim in view of Peeters et al., and further in view of Crawford.

Claim 21 was also rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim, Peeters et al., and Crawford, and further in view of Perets et al.

Claims 23 and 24 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim and Peeters et al., and further in view of Perets et al.

Applicant's claims 2 – 14, 16 – 21, 23 – 27, and 29 – 30 are believed to be allowable at least because of their dependency on claim 1, 15, 22, or 28. Accordingly, the rejections of claims 2 – 14, 16 – 21, 23 – 27, and 29 – 30 are believed to be overcome.

## RESERVATION OF RIGHTS

In the interest of clarity and brevity, Applicant may not have addressed every assertion made in the Office Action. Applicant's silence regarding any such assertion does not constitute any admission or acquiescence. Applicant reserves all rights not exercised in connection with this response, such as the right to challenge or rebut any tacit or explicit characterization of any reference or of any of the present claims, the right to challenge or rebut any asserted factual or legal basis of any of the rejections, the right

to swear behind any cited reference such as provided under 37 C.F.R. § 1.131 or otherwise, or the right to assert co-ownership of any cited reference. Applicant does not admit that any of the cited references or any other references of record are relevant to the present claims, or that they constitute prior art. To the extent that any rejection or assertion is based upon the Examiner's personal knowledge, rather than any objective evidence of record as manifested by a cited prior art reference, Applicant timely objects to such reliance on Official Notice, and reserves all rights to request that the Examiner provide a reference or affidavit in support of such assertion, as required by MPEP § 2144.03. Applicant reserves all rights to pursue any cancelled claims in a subsequent patent application claiming the benefit of priority of the present patent application, and to request rejoinder of any withdrawn claim, as required by MPEP § 821.04.

## CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney ((480) 659-3314) to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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